

## Earth Mesosphere Temperature Measurements via Sodium Lidar

Completed Technology Project (2016 - 2017)



## Project Introduction

This CIF effort is part of a larger research program. It addresses the front-end, lower TRL development of what will become the first ever spaceborn, Na laser spectroscopic instrument. The core of the CIF effort, nonlinear wavelength conversion and tuning a space-quality laser from its fundamental frequency of 1066nm to the Na absorption frequency of 589 nm, is a highly innovative development and necessary for the proposed application. Clearly additional work is needed to develop a space qualifiable laser spectrometer, such as power scaling and OM packaging, which will be addressed by related research efforts, including IRAD and possible ROSES and/or Heliophysics Solar Terrestrial Probe opportunities. The instrumentation under this research effort will serve as the core for the planning of a spaceborne LIDAR to measure the mesospheric Na layer.

## Anticipated Benefits

This effort addresses a pressing need in the Ionosphere - Thermosphere - Mesosphere (ITM) community for high-resolution measurements that can characterize small-scale dynamics (i.e. Gravity Waves with wavelengths smaller than a few hundred km) and their global effects in the Mesosphere-Lower-Thermosphere (MLT). This is compelling because such dynamics are believed to be the dominant contributors to momentum transport and deposition in the MLT, which largely drive the global circulation, thermal structure and interactions with the tides. Key to high-quality measurements is a spaceborne, sodium (Na) LIDAR to measure global Na density and temperature in the MLT with adequate spatial and temporal resolution. This laser would need to lock onto the Na absorption line at 589 nm, and maintain this in a space environment with adequate power. This CIF effort seeks to develop the tuning capability for such a unique laser.



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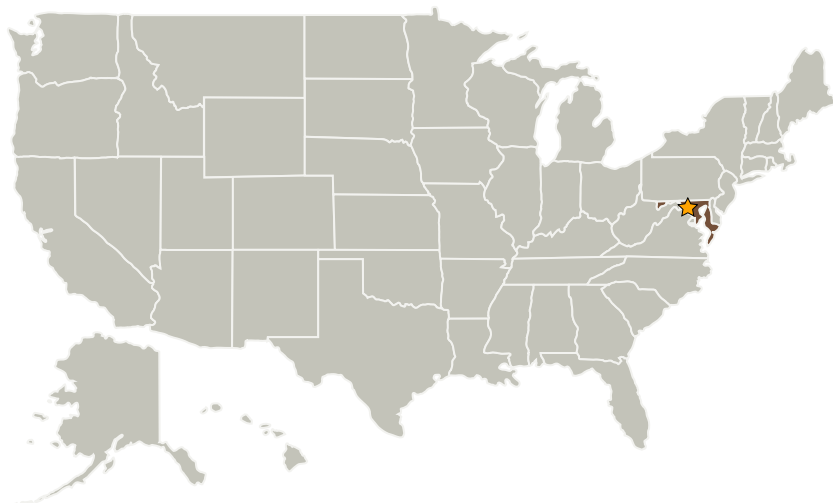
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

## Primary U.S. Work Locations

Maryland

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Center Innovation Fund: GSFC CIF

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

Peter M Hughes

**Principal Investigator:**

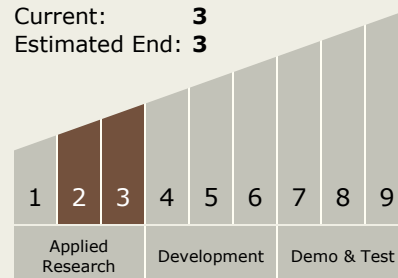
Diego Janches

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



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## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.5 Lasers

## Target Destinations

The Sun, Earth